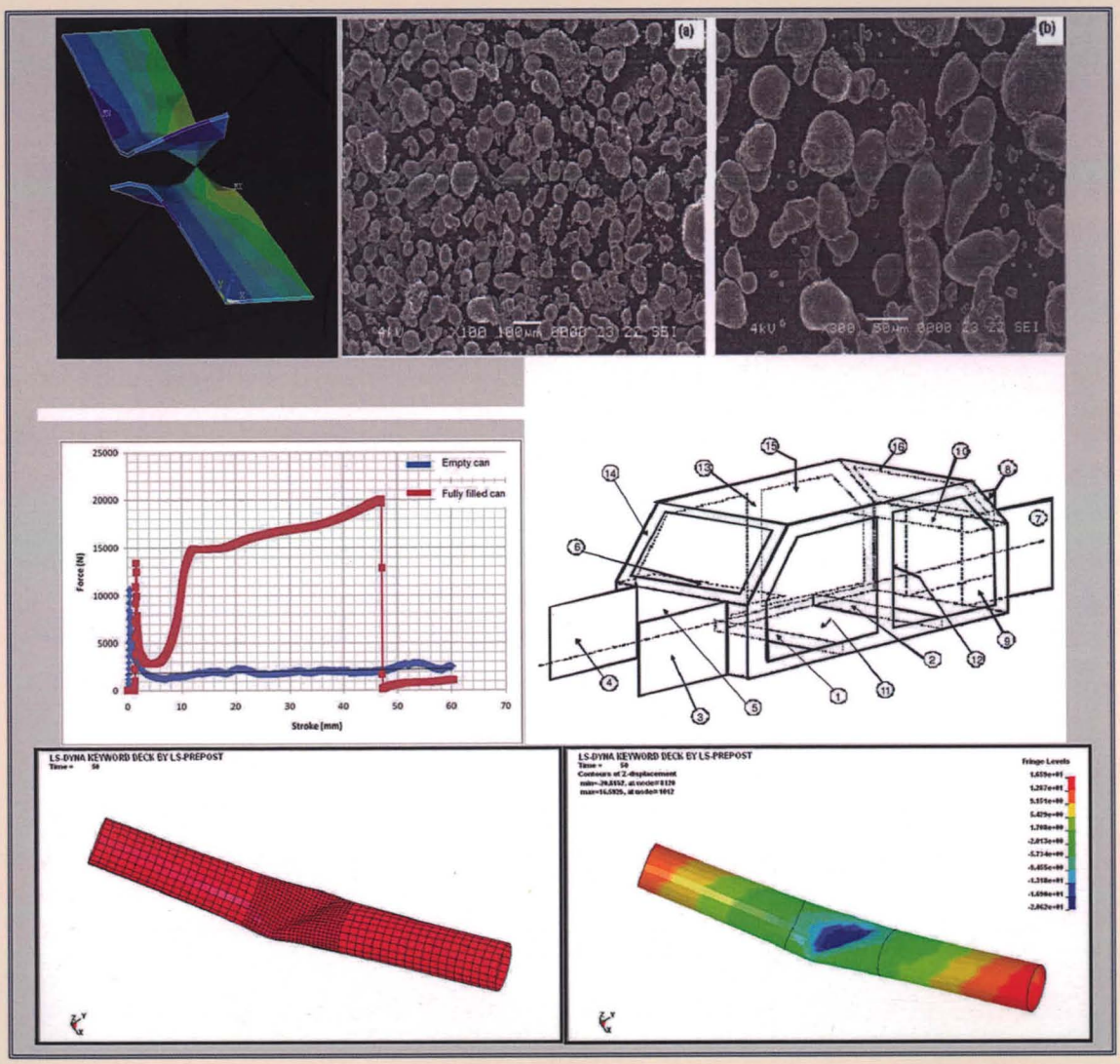
ADVANCED TOPICS IN MECHANICAL BEHAVIOR OF MATERIALS



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Meftah Hrairi

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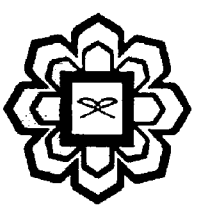

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ANALYSIS OF LIGHTWEIGHT STRUCTURAL TUBES FOR CRASHWORTHY CAR BODY

Kassim A. Abdullah and Zahra Roslan

1. INTRODUCTION

Basically, the study of vehicle crashworthiness is associated with investigations of the energy absorption capability of components of a vehicle during an impact. A crashworthy car body should be able to dissipate energy from an impact through its body in the form of structure deformation and impede any means of the energy from reaching the vehicle occupants [1]. In a frontal crash the longitudinal rails are subjected directly to 50% of the crash energy [2]. As for that, this project focuses on studying the longitudinal rails and developing methods in improving the crashworthiness of the rails.

2. METHOD OF INVESTIGATION

Simulations involved crash tests and the analysis of the longitudinal rail module by varying materials and cross section geometry properties. For materials, Magnesium alloys, aluminum alloys and also steel had been compared and studied. In terms of cross sectional geometry; the study made compares five basic different geometries. These are Sharp-edge rectangle, hexagonal, elongated oval, circular and round edged rectangle

In material comparison, the crashworthiness factor Ψ was used as suggested in [3] and expressed as:

$$\psi = \frac{3GV_0^2}{8\sigma_0 A \delta_f \varepsilon_r} \tag{1}$$